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COYOTE DIET AND WILD TURKEYS IN THE SOUTHEAST

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INTRODUCTION

At the time of European settlement, coyotes were distributed mainly in the western half of North America. Starting in the 1950s the coyotes began to expand their range into the southeastern states. Reasons given for this range expansion include: human introductions, changing land use practices, and extirpation of the red wolf. Hill et al. (1987) documented 20 instances where coyotes were released or escaped from captivity in the Southeast from 1925 to 1981. Clearing large tracts of forest land for timber and agriculture created ideal habitat for coyotes. It is believed that red wolves, the indigenous canid predator prior to European settlement, excluded coyotes from their territories.

Coyotes are now present in all southern states, and have become a permanent addition to southeastern fauna. Naturally, land owners, sportsmen, and wildlife biologists are curious about the role of coyotes in southeastern ecosystems. Wild turkeys are important culturally and economically in the region. Studies show that predators may kill enough wild turkeys or destroy enough nests to limit local turkey populations (Everett et al. 1980). Most wild turkeys killed are nesting/brooding hens and flightless poults less than 14 days old (Speake et al. 1985, Seiss 1989, Palmer 1990). Prior to the reproductive season, turkeys are generally still grouped together on winter ranges often located in bottomland hardwood forests. Hen flocks breakup temporarily during the spring reproductive season and hens use a greater variety of habitats. The behavior of hens during the spring reproductive period apparently makes them more vulnerable to predators. Hens are more solitary during nesting, and may jeopardize their own safety in an effort to protect poults.

Many different mammal and avian predators hunt wild turkeys. These include bobcats, foxes, feral dogs, hawks, and owls. Raccoons, opossums, skunks, crows, and rat snakes destroy many nests and may consume young poults (Speake 1980). The coyote's role as a predator of wild turkeys is unclear. Many turkey hunters report coyotes are attracted to turkey calls, and some sportsmen observe coyotes attacking adult wild turkeys. Coyotes are characterized as extremely opportunistic and adaptable foragers.

Therefore, it is logical to assume coyotes may also consume young turkey poults and eggs.

Previous researchers studied the southeastern coyote diet by analyzing stomach contents and/or scats (Wilson 1967, Michaelson 1975, Hall 1979, Gipson 1974, Lee 1986, Smith and Kennedy 1983, Wooding 1984, Blanton 1988, Hoerath 1991). Several of these studies were conducted before wild turkey reintroductions were successful and wild turkeys had become numerous. Other studies did not collect samples during the wild turkey reproductive season. Some studies collected samples from a wide geographic area, thus combining data from areas without turkeys with data from areas that may have supported wild turkey populations. Still other studies made no attempt to identify bird species found in stomachs or scats. Although some samples could be geographically linked to an abundant wild turkey population (Hoerath 1991), the sample size on which to base judgements was small. The overall proportion of wild turkey in the coyote diet during the wild turkey's reproductive season was unknown.

The objective of this study was to determine the proportion of wild turkey in the spring coyote diet in areas where wild turkeys were abundant. In addition, the proportions of other prey species in spring coyote diet were determined.

STUDY AREAS

Study areas needed to have abundant wild turkey populations to insure that wild turkeys were available to coyotes. The techniques to accurately count wild turkey populations are still being developed (G. Hurst, pers. com.). However, certain areas of the Southeast have long held reputations for harboring abundant wild turkey populations. I identified four such areas: Tall Timbers Research Station in Florida, Sumter Farms in Alabama, Merigold Hunting Club in Mississippi, and Holla Bend National Wildlife Refuge in Arkansas.

Tall Timbers Research Station is located in Leon County, Florida in the Tallahassee Red Hills region. The 1,376 ha area is dominated by open stands of large diameter loblolly and shortleaf pine. Hardwood stands, locally referred to as "hammocks," are found along streams throughout the pine uplands. Approximately 15% of the area consists of small scattered agricultural plots. An annual burning program promotes the development of native legumes and other wildlife food plants. An on-going wild turkey radio telemetry study was conducted concurrent with this study by Chuck Peoples of Auburn University. Chuck's study provided valuable information concerning the timing of wild turkey reproduction and the role of coyotes as predators on turkey poults.

Sumter Farms is located in Sumter County, Alabama. The 3075 ha area is located on the border of the Blackland Prairie and Interior Flatwoods resource areas.

The Noxubee River forms the northeast boundary. The area is covered by a heterogenous mix of upland pine forests, bottomland hardwoods, pasture, and row crops. Many food plots are planted each year, and uplands are burned annually.

Merigold Hunting Club is located on batture land in Bolivar County, Mississippi. The 6475 ha area is bordered on the west by the Mississippi River and on the east by the main levee. The majority of the area is bottomland hardwood forest. Several large openings exist on old sand bars. There, the vegetation consists of a variety of forbs, grasses, clovers, and corn. Wild hogs are present at Merigold in addition to native species.

Holla Bend National Wildlife Refuge is located on the floodplain of the Arkansas River. The 2549 ha area is a classic example of oxbow lake formation. The Arkansas River now forms the northern boundary, and a series of oxbow lakes delineate the old river channel on the south, east, and west. The center of the refuge is intensively farmed to furnish food for migrating and wintering waterfowl. Bottomland hardwood forests surround the agricultural lands which are planted in corn, soybeans, and winter wheat. Holla Bend served as the trapping area for reintroductions of turkeys to other areas of Arkansas.

METHODS

There are four basic approaches to predator diet studies: (1) direct observation, (2) observation of prey remains, (3) stomach analysis, and (4) scat analysis. It is often difficult to obtain adequate sample sizes using the first three methods. Coyotes in the Southeast are usually cryptic, and direct observations of predation acts are rare. Prey remains are infrequently encountered, and identification of the mortality agent is often impossible. Stomach analysis may be appropriate for large geographic areas, but this method requires the destruction of the study animal and only furnishes a one-time sample of the individual coyote's diet. Removal of coyotes from an area also upsets the social organization of the resident population. To continue collecting samples, new individuals must constantly emigrate from outside the study area. Scats are relatively numerous, easy to collect, and do not require the destruction of the study animal. Therefore, scat analysis was chosen as the most practical method for this study.

Roads and trails were traveled on each study area, and coyote scats were collected, placed in plastic bags, and frozen. Study areas were visited twice monthly. Scats were collected from 15 March to 12 July in 1991, and 16 January to 1 August in 1992. The collection period, 16 January 1992 to 15 March 1992, was labeled the winter non-reproductive season, and it served as a control to test for seasonal changes in coyote diet between winter and the wild turkey reproductive season.

Scats were oven dried at 60-80° C, placed in hand-sewn rip-stop nylon bags, washed in an automatic clothes washer, and oven dried again. Contents of each bag

were emptied onto a 0.5 x 0.5 cm screen placed over a tray to facilitate separation of bone, hair, and other diagnostic parts (Kelly 1991). Remains were identified to species, Genus, or Order by comparing them to a reference collection of hair, teeth, bones, feathers, and seeds. Keys to mammalian hair (Moore et al. 1974, Wilkins et al. 1982) and feathers (Day 1966) were also used for identification. The percent of scats containing a prey species was calculated separately by study area for the 1991 and 1992 reproductive seasons and for winter 1992. Wild turkey eggshells, one to two day old domestic turkey poults, and eight day old wild turkey poults were fed to captive coyotes to qualitatively examine the effects of coyote digestion on detectability in scats.

Assuming vulnerability of wild turkey hens, poults, and eggs increases due to the reproductive process, then there should be an increase in turkey remains in coyote diet as spring progresses. Scats collected during the winter and during wild turkey reproductive seasons were classified as containing turkey remains or not containing turkey remains. A 2 x 2 G-factor test of independence was used to test the hypothesis that the proportion of scats containing wild turkey remains was equal between the winter control period and the two breeding seasons. Two G-factor tests were conducted, one not including eggshells believed to be wild turkey, and one counting wild turkey-like eggshells as wild turkey occurrences.

RESULTS

The 2 x 2 G-factor test showed no significant increase ($G = 2.432$, $p = 0.119$) in wild turkey remains between winter collected scats and scats collected during the wild turkey reproductive season (Fig. 1). There were 13 occurrences of wild turkey (excluding wild-turkey like eggshells) in 906 total scats, or 1.4%. Wild turkey occurred in 1 scat of 218 collected during the winter or 0.46%. During the spring reproductive season 12 scats of 688 or 1.9% contained wild turkey. Wild turkey poult occurred in one scat.

Figure 1.

	P_1 With Turkey	P_2 Without Turkey	
Winter Scats	1	217	218
Breeding Season Scats	12	676	688
	13	893	906 = N

$G = 2.432$
$p = 0.119$
$\alpha = 0.05$

If wild turkey-like eggshells are counted as wild turkey occurrences and added to the other occurrences, then a 2 x 2 G-factor test shows a significant increase ($G = 6.860$, $p = .009$) in wild turkey remains during the spring reproductive season (Fig. 2). Overall, 23 scats of 906 or 2.5% contained wild turkey, and 22 scats of 688 or 3.3% contained wild turkey during the reproductive season.

Figure 2.

	P_1 With Turkey	P_2 Without Turkey	
Winter Scats	1	217	218
Breeding Season Scats	22	666	688
	23	883	906

$G = 6.860$
$p = 0.009$
$\alpha = 0.05$

The southeastern coyote diet is composed mainly of four food items: cotton rats (Sigmodon hispidus), rabbits (Sylvilagus sp.), deer (Odocoileus virginianus), and fruit. The fruit species most commonly occurring during the wild turkey reproductive season are blackberries (Rubus sp.) and wild plums (Prunus sp.). Wild hog (Sus scrofa) was also a major food item at Merigold Hunting Club. The exact proportions of these items varied from study area to study area and from year to year, but these items consistently occupied the top four rankings among food items.

Deer, cotton rats, and rabbits constituted the bulk of coyote diet during the winter and early spring. Most deer consumed at this time of year is believed to be carrion. When hunting season ended, the proportion of deer in coyote diet declined markedly and reached very low levels prior to fawn drop. At this time of year, cotton rats and rabbits were the major prey species. Once fawns were available, the proportion of deer in the diet increased. At Merigold Hunting Club, the proportion of wild hog in coyote diet was high while club members were actively hunting wild hogs.

Coyotes readily utilize fleshy fruits when available; almost to the exclusion of other prey items. Fruit abruptly entered the coyote diet in late spring. At Tall Timbers Research Station, fruit was the most commonly occurring food item during the wild turkey reproductive season.

Small mice species (Peromyscus sp., Oryzomys palustris, Microtus sp., Reithrodontomys sp.) made up a small portion of coyote diet when considered as individual species. However, when considered as a group they were locally important. At Merigold Hunting Club, mice occurred in 21.7% of scats. Medium-sized mammals, such as raccoons (Procyon lotor), opossum (Didelphis virginiana), and beaver (Castor canadensis), occurred infrequently.

Birds, other than wild turkey, occurred infrequently. However, at Holla Bend and Tall Timbers, percent of scats containing avian remains was higher, 20.4% in winter at Holla Bend, and 16.3% in spring at Tall Timbers. The percentages possibly reflect the greater availability of birds at these study areas. At the other three study areas percent of scats containing birds ranged from 2.9% to 7.2%. Northern bobwhite quail (Colinus virginianus) occurred in one scat collected at Tall Timbers.

Insects occur frequently in coyote scats, but generally contribute very little volume to the scat. Therefore, the actual biomass of insects consumed by coyotes is relatively small compared to other prey items.

DISCUSSION

Two previous southeastern coyote diet studies (Lee 1986) and (Hoerath 1991) explicitly reported occurrences of wild turkey. Hoerath (1991) reported an annual occurrence of 0.2% for wild turkey, and Lee did not report a specific percentage.

More wild turkey occurrences (13) were reported in this study than Lee (1986) or Hoerath (1991) reported. This result possibly reflected the greater availability and vulnerability of wild turkeys on the four study areas. Wild turkey increased in the coyote diet during the reproductive season, but this increase was not statistically significant (excluding wild turkey-like eggshells). Wild turkeys formed a minor portion of the coyote diet on the four study areas, and this is consistent with previous studies. Numerous turkey hunters continue to report coyotes "coming in" to simulated turkey calls. Coyotes attempt to catch adult wild turkeys, but results of this study indicate coyotes are not regularly successful enough for wild turkeys to constitute a major portion of their diet. Furthermore, coyotes are scavengers, and some or possibly all the wild turkey remains identified in this study could have been scavenged.

The role of coyotes as predators of newly-hatched wild turkey poults is unclear. The qualitative examination of feeding trial scats, where newly-hatched poults were fed to captive coyotes, showed that newly-hatched poults would be difficult to detect in field-collected scats. However, poults greater than eight days old would be detectable. Coyotes were documented as predators on wild turkey poults by Chuck Peoples at Tall Timbers, but coyotes did not rank high on the list of poult predators.

Hoerath (1991) reported avian eggshells occurred in 5.2% of spring scats, and 2.9% of summer scats, "with most being thick and or flat enough to conform to turkey." Eggshell fragments found in coyote scats closely resembled wild turkey eggshells fed to captive coyotes. Coyotes were documented as consuming wild turkey eggs at Tall Timbers on two occasions during the 1992 reproductive season (C. Peoples, pers. com.).

Recent methods have been developed to calculate the biomass or percent fresh weight of prey consumed (Kelly 1991). Percent fresh weight of prey values are frequently higher than percent of scat values for large to mid-sized mammals (Kelly 1991). Feeding trials indicate that this relationship may also be true for wild turkeys. Percent fresh weight of prey values for adult turkeys were higher than percent of scat values. Therefore, when viewed from a biomass perspective, turkeys constitute a larger portion of coyote diet than when viewed from a frequency perspective. However, if biomass estimates are converted to approximate number of individuals consumed, then the number of individual turkeys and large to mid-sized mammals consumed is small compared to other prey species.

The percent of scat values for deer, cotton rats, rabbits, mice, birds, insects, and fruit were consistent with previous southeastern studies.

CONCLUSIONS

Wild turkeys constitute a small proportion of coyote diet on areas with abundant wild turkey populations during the wild turkey reproductive season. Wild turkeys increase in coyote diet during the wild turkey reproductive season, but this increase is not always statistically significant. Wild turkey populations are controlled by many interacting variables such as food supply, diseases, weather, and a variety of predators. Therefore, the results of a coyote diet study cannot completely predict the effects of coyote predation on wild turkey populations. All the other factors controlling a turkey population must be considered. Wild turkeys have existed with predators for thousands of years and have evolved effective life history characteristics for dealing with predation such as wariness, large clutch sizes, renesting, roosting at night, and flocking. Since wild turkeys constitute a small portion of coyote diet, by themselves, coyotes are unlikely to cause the decline of healthy wild turkey populations on good habitat. However, a struggling turkey population on unsuitable habitat, suffering from disease, poaching, or severe nest predation from other species may be affected by coyote predation. Coyotes would not be considered the root cause of poor wild turkey recruitment. Efforts to help wild turkey populations recover should be directed at improving the habitat or possibly the control of other predators.

The abundance of other prey species may reduce coyote predation on wild turkeys. An abundance and variety of other food reduces the likelihood that coyotes will concentrate hunting efforts on wild turkeys. However, a local concentration of prey

species may also concentrate predators. Cotton rats, blackberries, wild plums, eastern cottontails, and grasshoppers often inhabit the early stages of plant succession. Some wild turkey hens choose these early successional stages for nest sites (Hurst and Dickson 1992). Coyotes may randomly encounter nesting or brooding hens while hunting other prey items.

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